NASA SBIR/STTR Technologies

S1.05-7780 - Deep UV Blocking Particle Filter

PI: Vladimir Kochergin

MicroXact, Inc. - Blacksburg, VA

Identification and Significance of Innovation

Sensitive detection of neutral and charged particles in satellite survey missions, requires efficient rejection of EUV and Deep UV and visible flux. At present, commercially available filters offer deep UV rejection, limited particle transmission efficiency, and limited lateral dimensions. The team of MicroXact Inc., Virginia Tech and Old Dominion University (ODU) is proposing to develop a deep UV blocking particle filter for NASA and commercial applications that will combine superior mechanical stability, with efficient UV blocking and high particle transmission efficiency. The proposed filter is based on macroporous silicon with conformal pore wall coating by Atomic Layer Deposition..

Estimated TRL at beginning and end of contract: (Begin: 2 End: 4)

NASA SBIR/STTR Technologies

Proposal No. S1.02-7507– *Wafer Scale THz Wave Cryoprober*

PI: Dr. Vladimir Kochergin
MicroXact Inc. – Blacksburg, VA

Identification and Significance of Innovation

Wafer scale cryogenic probing solution for frequencies above 300GHz is needed for pre-qualification and testing of active (radars,) and passive (radiometer) microwave sensors that are used by NASA for a wide range of remote sensing applications. MicroXact Inc. is proposing to develop a semi-automated, closed cycle, wafer scale cryogenic probe station for testing at above 300GHz at controllable temperatures from 4.2K to 470K or higher. The proposed concept is based on MicroXact patent-pending multi-CCR cryogenic probe station design that enables utilization of COTS components for >110GHz frequency testing, including standard amplifiers, multipliers, waveguides. and high frequency probes, all of which are verified to function well down to cryogenic temperatures.
Expected TRL Range at the end of Contract (1-9): 6-7

G-10 thermal isolation
Radiation shielding
Cooling path
Cooling braids
Vibration isolating table legs
Bellows coupler to reduce vibration

Overview of system with the cooling system and vibration isolation components identified. (INSET) Expanded view of the chuck and probe area with the probes mounted directly to the multiplier chains and mounted to G-10 probe arm rods. The heat shielding is made transparent to expand the view.

Technical Objectives and Work Plan

Technical Objectives:
•O1 – Design the THz-wave dual CCR wafer prober and verify it meeting program goals via numerical modeling.
•O2 – Build a prototype probe arm jig and experimentally demonstrate low loss transmission at 500GHz when the probes/chuck are at 30K or below.
•O3 – Develop strategies for product commercialization and transition to manufacturing

Work Plan:
•Task 1 – 1st generation model of the Phase I test setup and THz-wave probe station.
•Task 2 – Procure components and build demonstration cryogenic probing setup.
•Task 3 – Demonstrate low loss 500GHz transmission at below 30K.
•Task 4 – Create 2nd generation model and set of documentation, simulate heat loads and THz transmission.
•Task 5 – Enhance the commercialization strategy.

NASA and Non-NASA Applications

•Wafer testing of microwave sensors (active and passive) that are used for measuring precipitation, clouds, for planetary landing, upper atmospheric monitoring, and global snow coverage, topography measurement and other Earth and planetary science applications (NASA).
•Wafer testing of microwave sensors (active and passive) that are used for various defense applications (DoD).
•Wafer testing of high frequency electronic components and circuits (DoE, commercial)

Firm Contacts

Dr. Vladimir Kochergin, CEO/President, MicroXact, (614) 917-7202, vkochergin@microxact.com
Ms. Elena Kochergina, CFO, MicroXact, (540) 394-4040, ekochergina@microxact.com

NON-PROPRIETARY DATA

Technical Objectives and Work Plan

Technical Objectives:
O1 – Design a model the deep UV blocking particle filter.
O2 – Develop a fabrication process of deep UV blocking MPSi particle filters and demonstrate experimentally both the efficient deep UV blocking and efficient particle transmission experimentally.
O3 – Develop strategies for product commercialization and transition to manufacturing.

Work Plan:
Task 1 – Design the particle filter and verify its performance by modeling.
Task 2 – Fabricate MPSi templates.
Task 3 - Perform conformal pore wall coating.
Task 4 – Perform vacuum UV and particle transmission characterization.
Task 5 – Enhance the commercialization strategy.

NASA Applications

Satellite survey missions (IMAP, MEDICI, DRIVE Initiative, EXPLORERs, DISCOVERY, CubeSats / Smallsats, etc.) (NASA).

Non-NASA Applications

Secure UV communication (DoD).
plasma parameter monitoring in tokamaks, particle detection in accelerators, lightning and aurora studies (DoE).
plasma monitoring in plasma etching systems, reactive ion etching systems (commercial).

Firm Contacts

Elena Kochergina
MicroXact, Inc.
1750 Kraft Drive, Suite 1007
Blacksburg, VA, 24060-6375
PHONE: (540) 394-4040
FAX: (866) 588-0908